REMOTING RADAR SCOPE WEATHER AND ASSOCIATED DATA VIA THE SLO-SCAN METHOD

Davis Benton
WBO, Galveston, Texas

INTRODUCTION

In December, 1965, a Radar and Telephone Transmission System (WB/RATTS-65) commonly referred to as Slo-Scan, was installed at the ESSA Weather Bureau Office, Galveston, Texas. Receivers were located at Ellington Air Force Base and the Weather Bureau Airport Station, Houston. A few months later the Flight Service Station at Houston, located adjacent to the WBAS, installed a TV monitor display unit. The Weather Bureau Airport Station near Port Arthur is also scheduled for a receiver. The purpose of the system is to remote radar scope weather and associated information via commercial telephone lines to accomodate multiple user needs.

DISCUSSION

A transmitter console (Fig. 1) which has a PPI cathode ray tube is tied directly into the WSR-57 radar. This remote PPI "looks into" a beam splitter. The other input to the beam splitter is from a data insertion device, where remarks, maps, overlays, etc. can be inserted. From this, a vidicon camera takes pictures which are then transmitted to the receiver stations. The pictures at the receiver sites are displayed either by a direct view storage method (Fig. 5) or a TV-type monitor (Fig. 4). In order to display a picture on the TV-type monitor, a receiver console (Fig.3) must be located at the remote site. The receiver console is very similar to the transmitter console except that it has a closed circuit TV camera to relay the picture to the monitor. This closed circuit TV transmission can accomodate several monitors within 1,000 feet of the receiver console. If monitors are more than 1,000 feet away another receiver console is necessary. Figure 6 shows a typical layout of the RATTS/65 system.

Echoes from the PPI scope and the additional inserted information are being continually updated by a scanning device from left to right. It takes 94 seconds for the scan to complete the sweep across the face of the bright tube display. Therefore, the pictures are not real time, hence the word Slo-Scan is derived.

In addition to the storage tube and data insertion device, the transmitter console has voice communications, range and other controls normally found on common repeater scopes. The three ranges available are 50, 125 and 250 nautical miles. The choice of range is controlled at the transmitter site. Each time the operator changes range, it is necessary to change the data insertion plate to fit the proper range. Data insertion plates are plexi-glass discs in geographical map form with imprinted information such as airport identifiers, coastal boundaries, rivers, lakes, and state lines.

With a white marking pencil the radar meteorologist keeps the insertion plate current by pointing out the various parameters. This is done by writing on the insertion plate: type, intensity, characteristic, movement, and tops of precipitation, etc. (Fig.7). This type of information is updated at least hourly and more often if weather conditions warrant. Other information such as AP, Chaff, and other non-weather echoes are entered as needed. During prolonged periods when there are no echoes on the scope, the contraction PPINE is inserted. We have found it very important to keep the data thorough and current. Besides providing the receiver sites with essential and useful information, it eliminates duplicating requests via the voice communication phone.

In this area, the 125 and 250 mile ranges are more appropriate since the receiver stations are near the edge of the 50 mile range display. In practice the 125 mile range is used when all or most of the echoes fall within this range. Through agreement with the users, it is assumed that very little if any activity is occurring beyond this range when it is in use. The 250 range is utilized at other times or upon requests from a user.

Problems occasionally arise when the scope is well saturated with echoes. The lack of blank space on the scope for annotations during these infrequent periods prompts more reliance on the phone system. The system goes in storage when the data insertion door is open or when the antenna is not in automatic horizontal rotation. Therefore, caution must be exercised in carrying out these operations. If at all possible the system should not be put in the storage mode until the sweep reaches the extreme right hand side of the tube. This procedure permits the entire picture to be displayed during the storage period instead of only a partial picture. A fairly discernible picture will be retained for about 15 minutes, after which a slow blooming effect from the center of the scope begins.

When the system is returned to operation from the storage mode, the entire network is erased and a new picture is presented. It usually takes about 3 complete sweeps (approximately 5 minutes) to bring it back to optimum clarity. It is periodically necessary to erase the display because of the blooming effect from persistent echoes. This can be accomplished by any of the three methods mentioned earlier or by depressing and releasing the storage button on the transmitter console. Each receiver at remote sites also has this independent capability of erasing the monitor display.

At Houston, the Flight Service Station monitors are primarily used for pilot briefing whereas the Weather Bureau displays serve numerous functions. The Houston forecasters have found that Slo-Scan is a valuable tool in preparing the first period of the forecast. Monitors

are located in briefing areas where they can be observed by several persons simultaneously. A normal lighted room does not materially affect picture quality. It is very similar to viewing an ordinary black and white television set.

Although the Houston Flight Service Station is not tied into the voice communications, there is in existence a hot line between Galveston and the FSS. This method of communications is utilized quite frequently for the purpose of Slo-Scan discussion and has proved very satisfactory.

An additional aid that is available in this area is the combined Houston-Galveston Weather Bureau local teletypewriter loop. (In the future "ESSA WEATHER WIRE SERVICE"). Narrative radar reports are entered on this loop by the radar meteorologists each hour and more often if weather conditions warrant. Included in these reports are rainfall rates and precipitation tops within 100 miles of the radar. Besides these reports being utilized by WBAS Houston personnel to assist in radar scope interpretation, a hard copy is given to FSS for broadcasting on 206 KC with an effective range of 350 miles.

User reaction indicates that Slo-Scan has generated considerable interest in the Houston-Galveston area. Representatives from television stations, private meteorological firms and industry (petrochemical and oil companies) have visited the offices for the purpose of investigating the desirability of obtaining a drop on the network. Conversation with these potential subscribers and current users indicate Slo-Scan is a popular means of remoting radar scope weather displays.

Following is a quote from the Chief of the Houston Flight Service Station in an evaluation report that was filed with his Area Office. "In the opinion of our operating personnel, this is one of the greatest improvements which has been made to FSS operations in quite a number of years inasmuch as it is a much needed and useful tool to utilize since we have taken on the pilot briefing program. This facility cannot praise too highly the advantages of and the consistence with which the Slo-Scan monitors on the WSR-57 depict information for our use."

CONCLUSION

Remoting radar scope weather is not new, however this method is unique in that it provides additional information with data insertion that is not available with the coaxial or microwave systems. Slo-Scan does not and was not intended to replace the radar console; but, with the aid of data insertion and voice facilities, it appears to be the next best method of fulfilling requirements for radar weather presentation. It materially increases the workload and responsibilities of the radar meteorologists. However, the beneficial results derived from this means of disseminating radar weather data would seem to more than justify any workload increase that becomes necessary.

The success of this new concept of remoting radar scope weather and associated data depends primarily on:

(a) Proper maintenance by Electronics Technicians.

(b) Proper operation and input by the Radar Meteorologists.

(c) Proper interpretation and dissemination by the users at the remote sites.

Initial reaction from all concerned with the program in the Houston-Galveston area over the past year indicates this can and is being accomplished.

- - - - - - - -

ACKNOWLEDGEMENTS:

Preparation of this paper was made possible by the full cooperation of all ESSA personnel at Weather Bureau Houston and Galveston under the direction of Meteorologist in Charge, Ervin A. Volbrecht; Bob Shaddon, Chief, Flight Service Station, Houston; and Major Paul Ulrich, Ellington Air Force Base, Houston, Texas.

ESSA TECHNICAL MEMORANDUM

Southern Region Subseries

The Technical Memorandum series provides an informal medium for the documentation and quick dissemination of results not appropriate, or not yet ready, for formal publication in the standard journals. The series is used to report on work in progress, to describe technical procedures and practices, or to report to a limited audience. These Technical Memoranda will report on investigations devoted primarily to Regional and local problems of interest mainly to Southern Region personnel, and hence will not be widely distributed.

These Memoranda are available from the Southern Region Headquarters at the following address:

Weather Bureau Southern Region Headquarters
10E09 Federal Office Building
Fort Worth, Texas (76102)

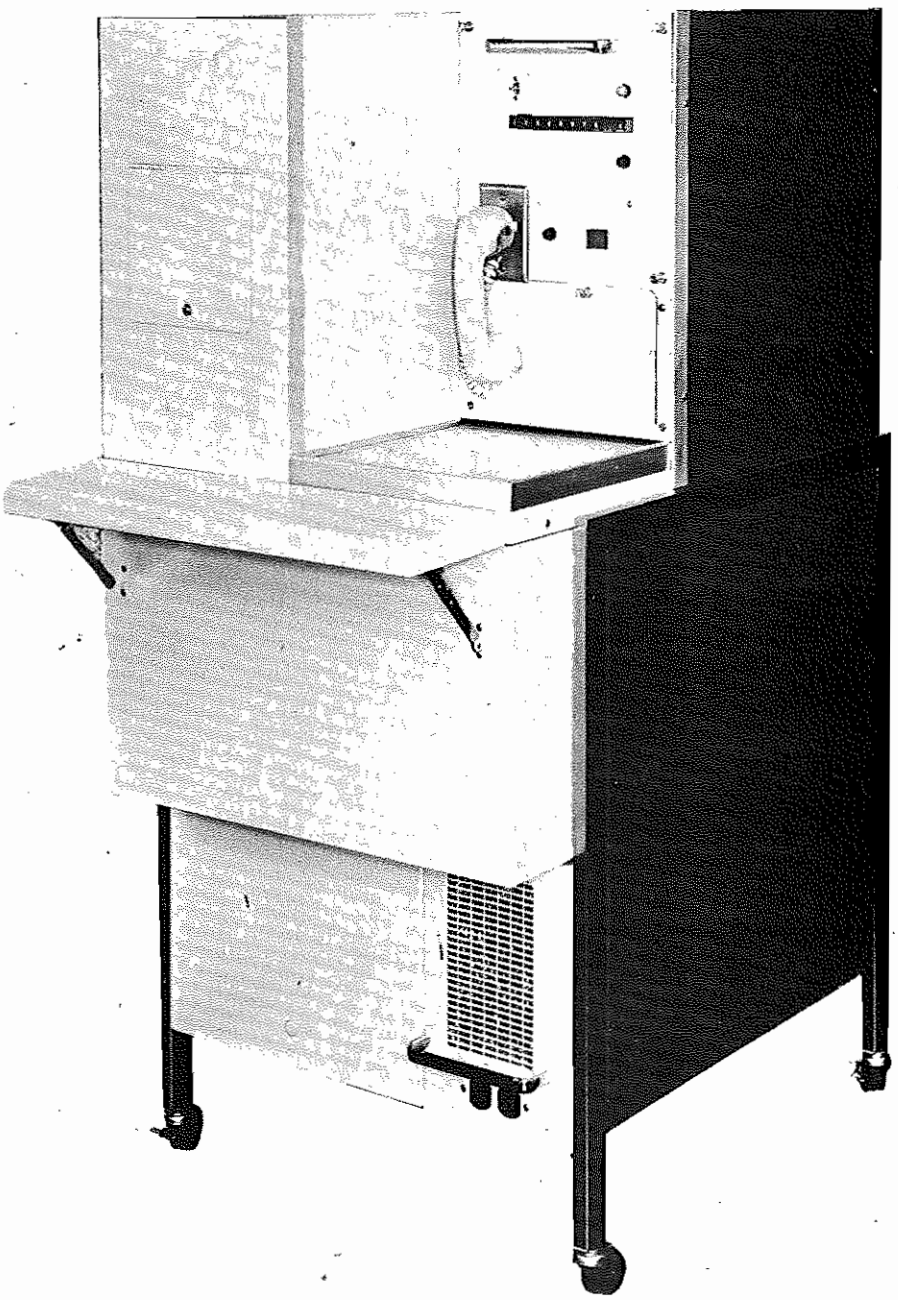

Fig. 1 TRANSMITTER CONSOLE - Located at transmitter site (WBO, Galveston)

Fig. 2 ON-LINE MONITOR - Located at transmitter site (WBO, Galveston)

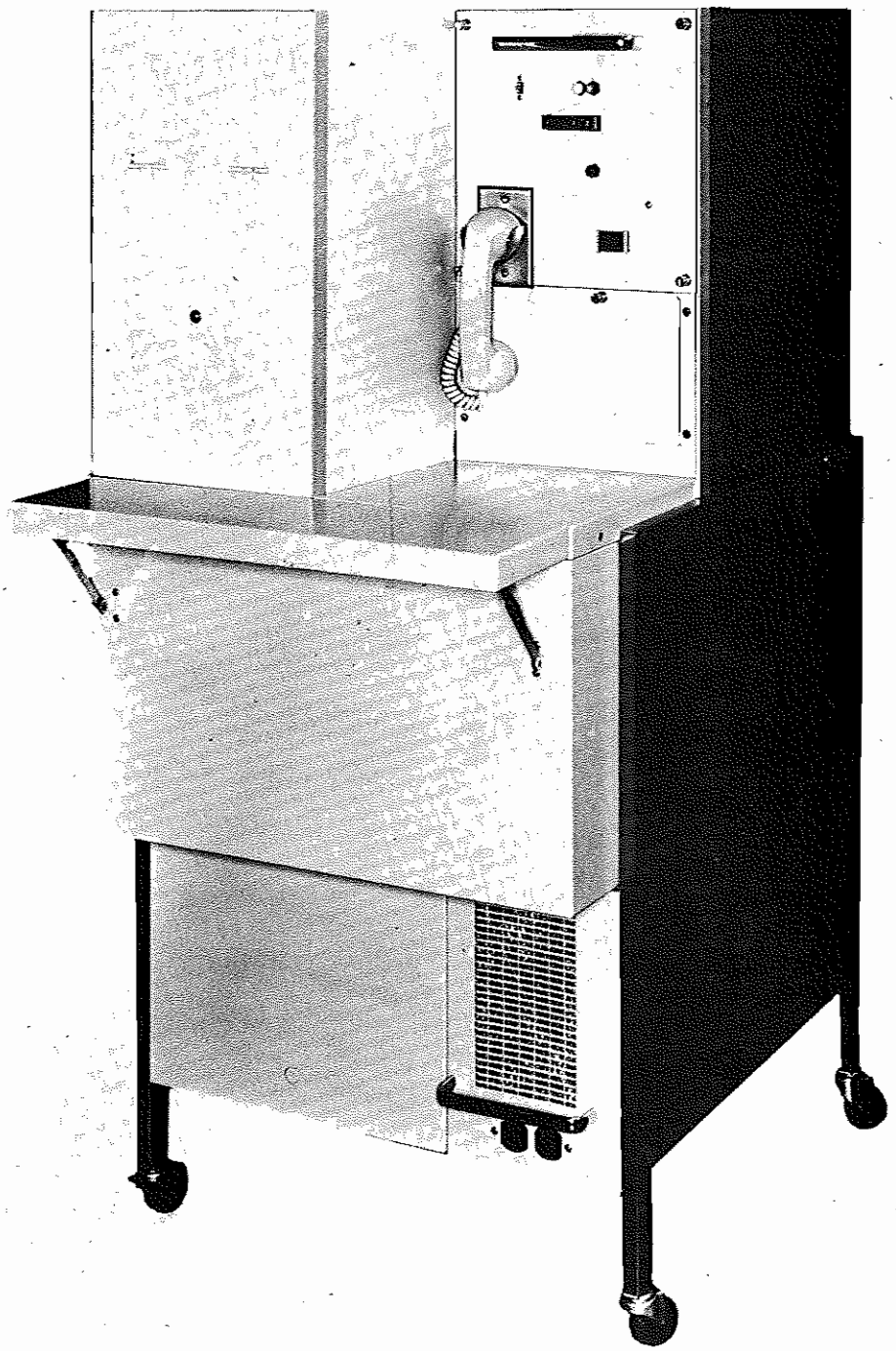

Fig. 3 RECEIVER CONSOLE (Very similar to TRANSMITTER CONSOLE) - Located at receiver station (WBAS, Houston)

Fig. 4 TV-TYPE DISPLAY - Located in viewing areas at receiver stations (WBAS & FSS Houston). Picture transmitted from Receiver Console via closed circuit TV

Fig. 5 AIR WEATHER SERVICE TYPE RECEIVER - Located at Ellington Air Force Base. This is a direct view storage tube similar to On-Line Monitor

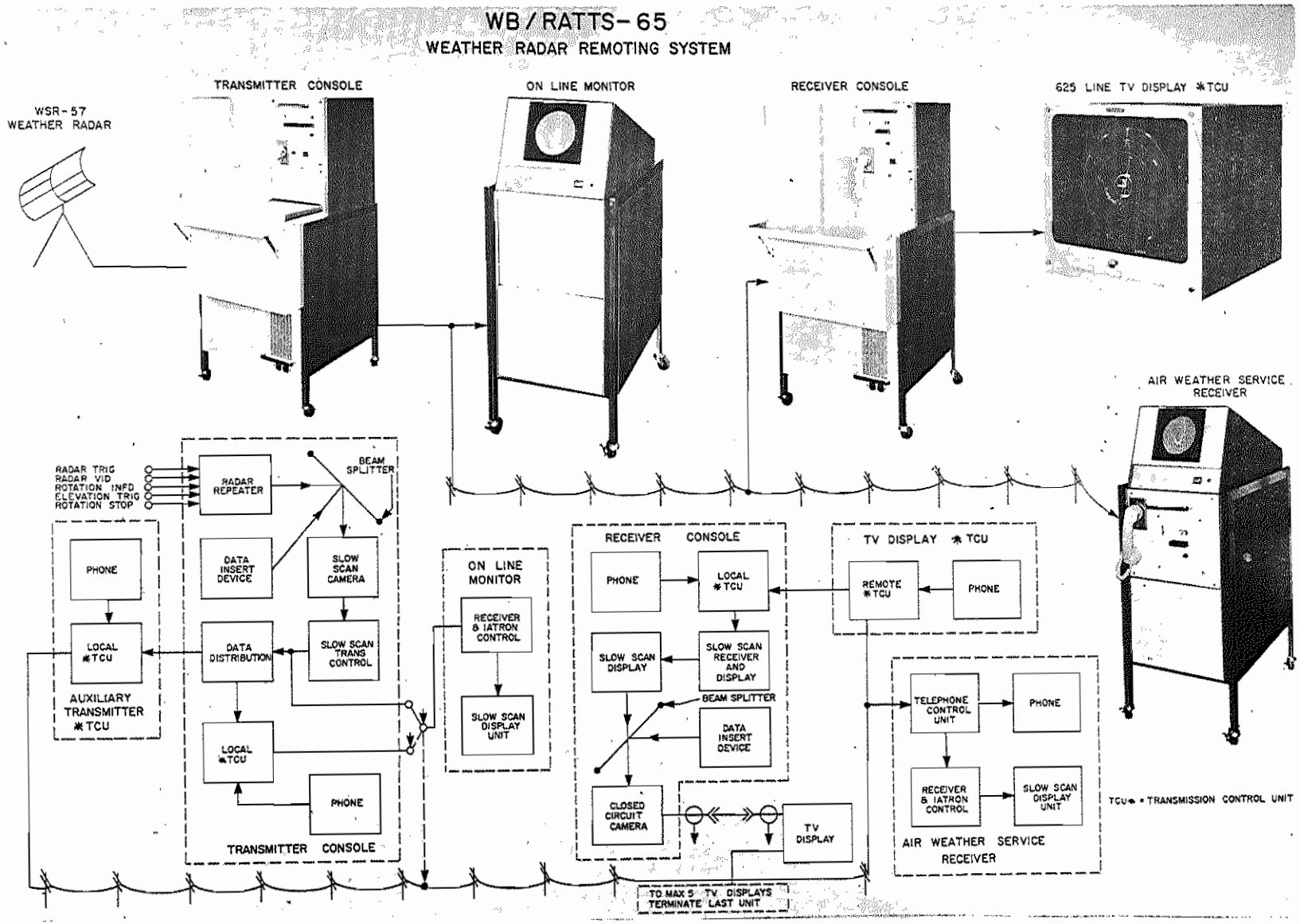

Fig. 6 TYPICAL LAYOUT OF SLO-SCAN SYSTEM

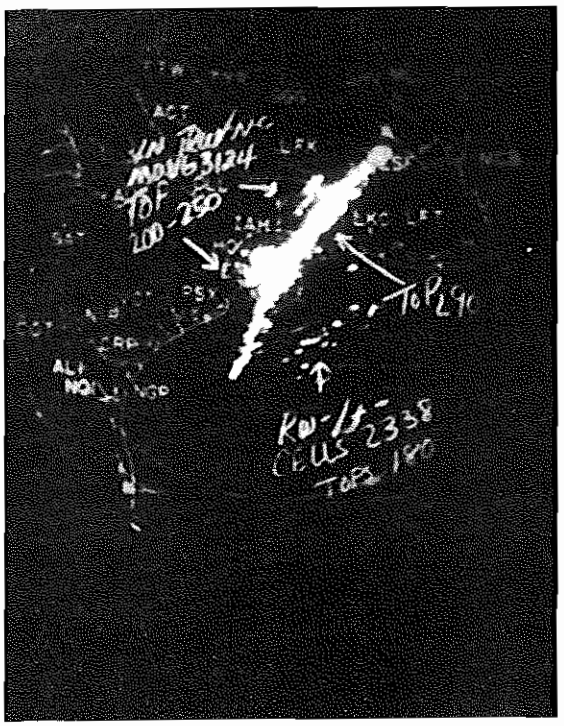

Fig. 7a Picture taken of 250 mile range, January 26, 1967, 1130CST. Annotations and arrows written dir rectly on Data Insertion Plate, pointing out line and movement of thunderstorms, intensities, tops, etc.

Fig. 7b Picture taken of 250 mile range, April 13, 1967, 0830 CST. Annotations and arrows written directly on Data Insertion Plate, pointing out line and movement of thunderstorms, intensities, tops, etc.

LIST OF SOUTHERN REGION TECHNICAL MEMORANDA

No. 1 Selection of Map Base for Small Scale Analysis and Prediction. Woodrow W. Dickey - May 19, 1965

No. 2 The Relationship of K-Values to Areal Coverage of Showers in the Mid-South. Jack Hollis and Kenneth E. Bryan - August 1965

No. 3 Some Notes on Waterspouts around the Lower Keys. R. Larry Mayne - August 1965

No. 4 Tornadoes Associated with Cyclones of Tropical Origin - Practical Features. E. L. Hill, William Malkin and W. A. Schulz, Jr. - September 1965

No. 5 Radar Echoes Associated with Waterspout Activity. Dorus D. Alderman - October 1965

No. 6 Probability Forecasting. Woodrow W. Dickey - October 1965

No. 7 Short Period Forecasting. Jeter A. Pruett - November 1965

No. 8 Southwest Texas Soaring Weather. David H. Owens - November 1965

No. 9 A Survey of Research in Agricultural Meteorology. Donald A. Downey - November 1965

No. 10 A Quick Look at the Results of One Month's Precipitation Probability Forecasting. George T. Gregg - January 1966

No. 11 Severe Storm Warning Systems in the Southern Region. Staff Members of Operations Division, Southern Region - February 1966

No. 12 The Lubbock Snowstorm of February 20, 1961. Billie J. Cook - April 1966

No. 13 Summary of Probability of Precipitation Forecasts in the Southern Region for the Period January through March 1966. Woodrow W. Dickey - May 1966

No. 14 Air Pollution Meteorology and Transport of Pollutants. Jose A. Colon - June 1966

No. 15 On the Mechanisms for the Production of Rainfall in Puerto Rico. Jose A. Colon - June 1966

No. 16 Teletype Techniques and Presentation Procedures for Public Weather Circuits. Jack Riley - June 1966

No. 17 Summary of the Pre-FP - Post-FP Forecast Verification Experiment. Woodrow W. Dickey - June 1966

No. 18 Fire Weather in the Southeast. Robert A. Mitchem - July 1966

No. 19 Severe Storm Warning Networks in Oklahoma. Gerald J. Carter and W. O. Garrison - July 1966

(continued) LIST OF SOUTHERN REGION TECHNICAL MEMORANDA

No. 20 Climatological Aids to Short Range Forecasting. Jerome H. Codington - August 1966

No. 21 A review of the Methods Developed for Forecasting Stratus in South Central Texas. Richard S. Schrag - August 1966

No. 22 Agricultural Forecasting at Tallahassee, Florida. J. S. Smith - August 1966

No. 23 The Use of Radar in Flash Flood Forecasting. Jack L. Teague - August 1966

No. 24 Short Range Forecasting Procedures at Savannah. David P. Barnes - August 1966

No. 25 On the Use of Digitized Radar Data for the Florida Peninsula. Neil L. Frank, Paul L. Moore, and George E. Fisher - September 1966

No. 26 Relative Humidity in Georgia. Horace S. Carter - September 1966

No. 27 Study on Duration of measurable Precipitation at Birmingham. Hugh B. Riley - September 1966

No. 28 The Weather Distribution with Upper Tropospheric Cold Lows in the Tropics. Neil L. Frank - September 1966

No. 29 On the Correlation of Radar Echoes over Florida with Various Meteorological Parameters. Neil L. Frank and Daniel L. Smith - October 1966

No. 30 A Study of the Diurnal Summer Wind System at Galveston, Texas. David H. George - December 1966

No. 31 A Simple Inexpensive Degree-Hour Counter. D. R. Davis and Jerrell E. Hughes - March 1967

No. 32 An Objective Technique for Forecasting the Possibility of an Afternoon Summer Shower at Savannah, Georgia. David P. Barnes, Jr. and Samuel C. Davis - March 1967

No. 33 An Empirical Method for Forecasting Radiation Temperatures in the Lower Rio Grande Valley of Texas. Leroy B. Hagood - March 1967

No. 34 Study on Duration of Measurable Precipitation at Lubbock, Texas. G. Alan Johnson and Thomas P. Clarke - April 1967